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Terraube, Julien

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Current Opinion in Environmental Sustainability

Strengthening protected areas to halt biodiversity loss and mitigate pandemic risks

This Commentary follows up on the previously published article (https://doi.org/10.1016/j.cosust.2017.08.005) which appeared in COSUST Volume 25, April 2017, Pages 50–58

Julien Terraube[1] and Álvaro Fernández-Llamazares[2]

[1] Global Change Ecology Research Group, University of the Sunshine Coast, Sippy Downs, QLD, Australia
[2] Helsinki Institute of Sustainability Science (HELSUS), Faculty of Biological and Environmental Sciences, University of Helsinki, Helsinki, Finland
e-mail: jterraube@gmail.com

The current COVID-19 pandemics is having a major impact on our global health and economies. There is widespread recognition that ecosystem disruption, including land-use change and illegal wildlife trade, is linked to the increasing emergence of zoonotic diseases. Here, we emphasize that protected areas play a fundamental role in buffering against novel disease outbreaks by maintaining ecosystem integrity. However, protected areas worldwide are facing increasing human pressures, which are being amplified by the unfolding COVID-19 crisis. Increased resources are thus urgently needed to mainstream a One Health approach to protected area management, focusing specifically on i) monitoring illegal wildlife trade, ii) biodiversity trends and iii) surveillance of zoonotic pathogens. Improving integration of public health into global biodiversity conservation policies should be a top priority to reduce the risk of future pandemics.

Protected areas mitigate zoonotic disease spillover risks

In the midst of the current pandemic caused by the emergence of the SARS-CoV-2 virus causing COVID-19, it is more evident than ever that emerging infectious diseases are a major threat for our global health and political stability. Ecosystem disruption and subsequent biodiversity loss are related to the emergence of infectious zoonoses worldwide [1]. Land conversion has been linked to changing host population densities and increased pathogen diversification, driving disease spillover in modified landscapes [2•,3]. Land-use changes are also associated to the creation of road networks, further enhancing hunting pressure on wildlife populations [4]. A series of emerging infectious diseases, for example, SARS, Ebola and MERS, have been linked to wildlife use, trade and consumption [5••]. Wildlife trade in Chinese wet markets has also been implicated as an important factor in the COVID-19 emergence [6].

Land-use changes and wildlife consumption and trade are two important threats impacting the global protected area network [7]. Hunting-induced defaunation has been shown to impact 20% of tropical forest protected areas [8]. Recent research has shown that numerous protected areas are facing intense human pressures [1,9,10], resulting in increased downgrading, downsizing and degazettement events [11]. However, large, well-funded and well-managed PAs are effective in preserving ecosystem health [12–14]. There is increasing recognition that PAs may buffer against the emergence of novel infectious diseases by avoiding drastic changes in host/reservoir abundance and distribution, and reducing contact rates between humans, livestock and wildlife [15–18]. The current COVID-19 pandemics further emphasizes the fact that PAs are at the forefront of preventing future disease outbreaks by maintaining ecosystem integrity [19]. Overall, these successive disease outbreaks have highlighted the importance of a collaborative, multi-sectoral, and transdisciplinary *One Health* approach with the goal of achieving optimal health outcomes that recognize the inter-connections between people, animals, and the environment [20]. Given ongoing discussions on the elaboration of a post-2020 Global Biodiversity Framework, the time is ripe for showcasing the

essential role of PAs in maintaining biodiversity and promoting global human health.

A line of defence against illegal wildlife trade

There is well-established evidence that PAs are a major source of illegal wildlife trade [7,21]. With wild vertebrates being reservoirs of a large repertoire of zoonotic pathogens, wildlife trade enhances several pathways of zoonotic pathogen spillover [5••]. Hence, in response to COVID-19, there have been several calls to ban all wildlife trade and shut local wet markets [22•]. Many of these large-scale blanket bans do have unintended consequences for PAs, as they can undermine safe, legal and sustainable wildlife trade for communities living in and around PAs for whom wildlife constitutes a safety net [21,22•,23,24]. In the absence of strong law enforcement, wildlife trade bans can also drive wildlife trade to move underground [25]. Where bans remove legal supply options (e.g. captive breeding), they can accelerate illegal trade, increasing prices on black markets and driving overexploitation of wild species [26]. In fact, there are emerging reports that the loss of conservation revenue caused by COVID-19 and the reduced capacity for patrolling and law enforcement has resulted in increasing levels of illegal poaching in many PAs worldwide [23,27•,28]. PA managers are one of the first lines of defence against both emerging zoonoses and illegal wildlife trade. Therefore, they can play a critical role in better characterizing wildlife trade pathways, assessing conflicts emerging from wildlife bans, and promoting larger on-the-ground discussions on the complex web of inter-relations between wildlife trade, conservation, and global disease risk [22•,29]. We believe that the COVID-19 pandemics offers an interesting opportunity to reify the role of PAs in reducing the risk of further zoonoses and supporting human health.

Monitoring biodiversity on the frontlines of pandemic risk

High-risk areas for the mitigation and surveillance of novel disease emergence can be identified depending on levels of habitat fragmentation and human encroachment into natural habitats [30]. In addition, competent reservoir species are more likely to be generalist species that have adapted to human-dominated landscapes [31,32]. Therefore, shifts in mammalian community composition could be an early warning system indicating decline in threatened wildlife populations, ongoing homogenization at the community level, and ultimately poor PA effectiveness, and high risk of infectious disease emergence. Integrating remote sensing and emerging technologies like iDNA (invertebrate-derived DNA) into PA monitoring schemes is a promising approach to monitor habitat degradation, vertebrate populations, and specific or novel pathogens [33–36]. Increased conservation resources are thus needed to mainstream this *One Health* approach to wildlife monitoring across networks of PAs [37]. This will allow identifying PAs and surrounding buffer areas needing urgent attention and funding to restore ecological integrity and decrease risk for infectious disease emergence. We argue that a 'disease risk mitigation' dimension would complement new protected area targets post-2020 based on ecological outcomes [38] and would improve integration of human health into global biodiversity conservation policies.

Concluding remarks

The current COVID-19 pandemics poses an exceptional opportunity to raise awareness not only of the complex inter-connections between the health of people, wildlife, and our shared environment [5••], but also of the important role that a well-managed, sustainable and effective PA network plays in preventing the spillover of diseases from wildlife to people [39••]. Rampant levels of deforestation, increasing levels of illegal wildlife trade and encroachment in natural areas, threaten the ecology integrity of many PAs and should be therefore understood as a ticking time bomb for further zoonotic disease spillover [40–42]. With a rapidly accelerating human footprint [1], the role that PAs have historically played in regulating zoonotic disease dynamics cannot be considered as unlimited anymore [39••]. As such, there is a greater need than ever to adopt a *One Health* approach in PA management, targeting areas with a high-risk of emergence of zoonotic diseases for integrated conservation planning and management, and implementing monitoring systems for early detection of emerging infectious disease events and illegal wildlife trade. More broadly, we argue that effective and equitably managed networks of PAs can and should be part of the response to reduce the risk of future zoonotic pandemics.

Conflict of interest statement

Nothing declared.

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